Encapsulation of Methamphetamine-Contaminated Building Materials

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Introduction:

Concerns regarding chemical contamination associated with the clandestine production of methamphetamine have been realized for some time. [1 – 10] Work conducted by National Jewish Medical Center Researchers has documented a number of the contaminants generated at clandestine laboratories and the presence of some of these contaminants in actual methamphetamine laboratory investigations.[11] The predominant contaminant was found to be the drug, methamphetamine, itself. Methamphetamine was found to aerosolize during the salting-out phase conducted during all current production methodologies. It is released as an aerosol and can contaminate most surfaces within a structure.[11] Our research also indicated that the methamphetamine continues to be present within the structure for some period of time (months to years).

The levels of methamphetamine found within a structure after clandestine cooks is a factor of the type of cook and the number of cooks conducted. Red phosphorous cooks appear to result in a higher concentration of methamphetamine release than do anhydrous ammonia cooks and multiple cooks will result in a higher contamination level.[11] Surface wipes for methamphetamine were collected at suspected methamphetamine laboratories during law enforcement actions. A total of 14 suspected laboratories were sampled with all of the laboratories having at least one sample positive for methamphetamine. The levels of methamphetamine found ranged from a low of 1.0 μg/sample to a high of 16,000 μg/sample. The overall mean methamphetamine contamination level in these suspected laboratories was 511 μg/sample with a median contamination level of 28 μg/sample.

Further research has indicated that simply by using methamphetamine, the drug will be deposited on surfaces within the structure.[13] We conducted a simulated "smoke" using methamphetamine and found that a significant amount of methamphetamine is released during that process. Depending upon how much methamphetamine is used within a structure the mean level of methamphetamine on the walls may range from less than 0.1 ug/100 cm^2 to as high as 5 ug/100 cm^2. These lower levels of contamination are being more commonly encountered as residences are increasingly monitored for methamphetamine during realty transactions. As low as these levels appear to be, they are normally above the levels that have been promulgated by the states for cleanup.

At this time, the primary methodology utilized by clandestine methamphetamine laboratory remediation groups for cleanup of contaminated surfaces is by cleaning the surface with a surfactant. The widespread use of this methodology is due to reports that simply painting over a methamphetamine-contaminated surface will result in the methamphetamine penetrating the new paint and becoming available on the surface of the building material. In fact, most states do not allow the encapsulation of methamphetamine-contaminated surfaces as a sole methodology of remediation although, many states do suggest repainting surfaces after the decontamination has been removed.

In some cases, porous building materials (unpainted wood or drywall) do not lend themselves to cleanup using surfactants since washing the surface is not likely to remove

much of the methamphetamine that is present. In cases such as this, the ability to encapsulate any methamphetamine on the surface may aid in reducing exposures within the structure. In addition, areas that can't be easily cleaned may be remediated though the use of an encapsulating material. This study was conducted to determine the ability of paints to encapsulate methamphetamine on a painted drywall or plywood surface through the use of different paints and painting methods.

Methodology:

This study was conducted by contaminating a number of painted drywall and wood panels with methamphetamine and then determining the ability of paints to encapsulate the methamphetamine present. A total of 8 panels (4 wood panels and 4 drywall panels) that were approximately 24" x 24" square were contaminated with methamphetamine in the exposure chamber at National Jewish Health. The drywall was 3/8th inch gypsum board and the plywood was a sanded ¼ inch plywood. These materials were painted with a latex enamel paint by painting the surface with two coats of paint, letting the paint dry and then painting it again with the same latex paint. After the painting, the paint was allowed to dry for 1 day prior to contaminating the panels with methamphetamine.

Figure 1. Painting drywall with a base paint prior to contaminating the board in the chamber.

The methamphetamine utilized for contamination was a street-manufactured methamphetamine provided by the North Metro Task Force in Colorado. The drug was approximately 77% methamphetamine and also contained small amounts of amphetamine, ephedrine, and pseudophedrine. No MDMA or phenylpropanolamine were found to be present. The methamphetamine was put into a beaker and the chamber

was sealed and the methamphetamine aerosolized in the chamber. The methamphetamine was completely aerosolized within a short time (listed above) and the beaker heater was turned off. The fans within the chamber were kept running for another period of time to assure even distribution of the methamphetamine. The chamber was then allowed to sit overnight and the material was removed the next day.

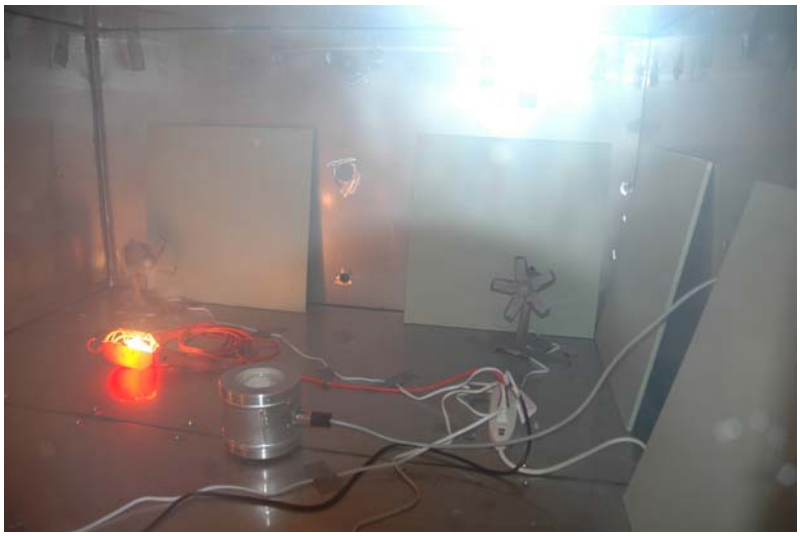

Figure 2. Painted drywall material being contaminated within the chamber.

The panels were contaminated with methamphetamine on 9/2/2008 using a total of 214 mg of methamphetamine. The cook was initiated at 12:45 pm and stopped at 1:02 pm. The fans in the chamber were kept on until 3:50 pm to allow for adequate mixing of the methamphetamine within the chamber. The boards were removed the next day at 1:00 pm and the panels placed in plastic bags and transported to an area to be pre-sampled, encapsulated, and post sampled.

Figure 3. Drywall being removed for transportation to an area to be sampled and treated.

After being transported, each of the groups of panels (drywall and plywood) were divided into 4 groups for testing. The groups were as follows:

a. One panel was not treated.
b. One panel painted with a latex paint using a roller.
c. One panel was spray-painted using an encapsulating paint (Kills).
d. One panel was spray-painted with an oil-based paint.

Five samples were collected prior to treatment and after treatment, resulting in a total of 10 samples being taken from each of the plywood and drywall panels. Each sample consisted of a 100 cm^2 area being sampled from the panel using a 3"x 3" cotton swab to which 3 ml of methanol were added which was then put into a plastic centrifuge tube for analysis.

For each panel, there were a total of 36 potential 100 cm^2 samples available. The squares sampled were determined using random number generator for each panel using numbers from 1 – 36. The two groups of 5 samples were generated with no replicates and the position of the samples were located on the panel using the following template:

i.	1	2	3	4	5	6
ii.	7	8	9	10	11	12
iii.	13	14	15	16	17	18
iv.	19	20	21	22	23	24
v.	25	26	27	28	29	30
vi.	31	32	33	34	35	36

Figure 4. Panel prepared for initial pre-sampling after contamination.

After the collection of the pre-samples, the panels were painted using the appropriate paint. The panels were painted and the paint allowed to dry. After the paint was dry to the touch, the panels were painted again using the same techniques. Adequate coverage was obtained for each of the panels with approximately 1 can of the spray paint being used for each panel. The latex paint was applied with a roller and separate rollers and pans for the paint were used for each painting to minimize cross contamination. After the treatment, the panels were sampled in the same manner as in the pre-sample portion of the project and the samples sent to DataChem laboratories for analysis.

On January 19, 2009, a second sampling effort was conducted to determine if methamphetamine had leached through any of the protective paint surfaces. On this date, 5 more samples were taken from each of the previously sampled panels and sent to DataChem Laboratories for analysis.

Results:

A total of 80 samples (not including blanks) were collected in this experiment, 40 each from the plywood panels and 40 from the drywall panels. The results of the sampling for the painted drywall was as follows:

Treatment	*Mean Conc. (ug/100 cm^2)*	*Median Conc. (ug/100 cm^2)*	*% Mean Reduction*	*% Median Reduction*
Untreated Pretest	29.7	31		
Untreated Post Test	27.2	27.0	8.3	12.9
Latex Paint Pretest	29.8	29.0		
Latex Paint Post Test	5.0	5.1	83.4	82.4
Kills Paint Pretest	28.4	30.0		
Kills Paint Post Test	0	0	100	100
Oil Based Pretest	34.6	34.0		
Oil Based Post Test	0	0	100	100

These results indicate that painting drywall with a latex paint using a roller does not totally encapsulate the methamphetamine present on the surface of the drywall. Approximately 20 % of the methamphetamine was able to penetrate the paint and was available on the surface of the material. Painting the surface of the drywall with an encapsulating paint or with an oil based enamel using a paint spray can appeared to

encapsulate the methamphetamine so that none of the methamphetamine was available using a methanol wetted wipe.

The results of the wood sampling were as follows:

Treatment	*Mean Conc. (ug/100 cm^2)*	*Median Conc. (ug/100 cm^2)*	*% Mean Reduction*	*% Median Reduction*
Untreated Pretest	31.2	31.0		
Untreated Post Test	27.4	27.0	12.2	12.9
Latex Paint Pretest	18.6	19.0		
Latex Paint Post Test	3.8	3.8	79.7	80.0
Kills Paint Pretest	23.6	24.0		
Kills Paint Post Test	0	0	100	100
Oil Based Pretest	16.4	16.0		
Oil Based Post Test	0	0	100	100

These results are very similar to the results obtained from the painted drywall. The latex paint that was applied using the roller did not encapsulate the total methamphetamine but did result in a 80% reduction in the amount of methamphetamine available to a wipe wetted with methanol. The spray painting of the painted wood surface with an encapsulating paint or an oil-based enamel paint did appear to eliminate the available methamphetamine on the surface of the painted wood.

The January 19, 2009 re-sampling of the panels revealed the following data:

Treatment	*Mean Conc. (ug/100 cm^2)*	*Median Conc. (ug/100 cm^2)*	*% Mean Reduction*	*% Median Reduction*
Kills Paint Re-test	0	0	100%	100%
Enamel Paint Re-test	0	0	100%	100%
Latex Paint Re-test	2.4	2.4	91.8%	91.7%

The kills Paint and the enamel paint continued to encapsulate the methamphetamine present, although one of the 100 cm^2 squares of the Kills Paint did come back positive at 0.13 ug/100 cm^2. This is a very low level and may have been due to panel contamination during storage. It is also similar to the levels found during the initial testing in September. The amount of methamphetamine removed from the surfaces that had been encapsulated by the latex paint were lower than previously noted. The levels had dropped approximately 50% from the levels observed at the end of the initial experiment. This loss is likely due to volatilization of the methamphetamine from the surface of the material.

Discussion and Conclusions:

In both the painted drywall and the painted plywood tests, it appeared that simply painting the surface with a roller and a latex paint does not completely encapsulate the methamphetamine available on the surface. This lack of coverage may be due to the type of painting conducted (the roller) or to the solubility of the methamphetamine in the water-based latex as opposed to the oil-based paint. In conducting the test, we attempted to minimize the effect of the roller by letting the paint dry prior to the second application and by using different pans and rollers between the two applications. This technique did result in approximately an 80% drop in the available methamphetamine at the surface of the material. A small percentage of that drop was due to the time between the pre and post testing (approximately 10%) but most was due to the painting itself.

In the case of the oil-based paints and the encapsulating paint, the sprayed on paints completely covered the methamphetamine present and available on the surface of the building materials. Almost all of the samples were below the detection limit of 0.050 ug/100 cm^2. Of the 20 post-treatment samples taken only 3 were positive with two occurring in the oil-based samples (0.056 ug/100 $cm^2$and 0.22 ug/100 cm^2) and one (0.057 ug/100 cm^2) in the encapsulating samples. Two of these samples are only slightly above the level of detection and the third is still very low and below many state standards. A total of 10 blanks were also taken and all except one were below the limit of detection (0.050 ug/100 cm^2). The positive blank was just slightly above the detection limit with a value of 0.07 ug/100 cm^2. It is quite possible, therefore, that the very low positives obtained during this testing were very low levels of contamination or slight laboratory variation.

The second sampling effort conducted on January 19, 2009 revealed that the enamel and Kills Paint were still protective with only one sample being positive (0.13 ug/100 cm^2). This positive sample was again very low and may have been a small amount of contamination, however, all of the blanks submitted in this sampling effort were <0.05 ug/sample.

Based upon the results of this study, it appears that the use of oil-based enamel or encapsulating paint that is sprayed upon a surface will result in an encapsulation of the methamphetamine that is available at the surface of the material. The study also shows

that the amount of methamphetamine at the surface is also significantly reduced using a latex paint and a roller, although this methodology is not as good as is the use of a sprayed on oil-based paint. In either case, repainting a surface may act to reduce the available methamphetamine.

This study was conducted for a period of approximately 4 months and the possibility of the methamphetamine coming through the surface at a future date is a possibility. As the surface of the paint erodes away due to cleaning or other natural occurrences, the methamphetamine may once again become available. Since the methanol wipe removes a significant amount of the surface of the paint, however, it may be quite some time before the methamphetamine is truly available. It may also be the case that the methamphetamine will be covered up for as long as the paint is intact. Painting therefore, may be an adequate means of control for the extended future.

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